

## Appendix to Correlations of the Queensland Permo-Carboniferous Basin.

A NEW SPECIES OF *PRODUCTUS* FROM THE LOWER  
BOWEN SERIES—QUEENSLAND.

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PLATES III-IV.

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### INTRODUCTION.

The material for the study of this new and interesting species of *Productus* has been made available to me by Mr. J. H. Reid from his private collection, and my thanks are due to Mr. Reid not only for the opportunity to study this interesting form, but for the generous help he has accorded me while working on it. My thanks are also due to Mr. W. S. Dun, of the Geological Survey of New South Wales, for much advice, and to the officers of the Australian Museum and Public Library, Sydney, for their assistance.

GENUS, *PRODUCTUS*, Sowerby.

SUBGENUS, *LINOPRODUCTUS*, Chao, 1927.

### SYNONYMS:

*Cora*, Fredericks, 1928. Bull. Com. Geol. Leningrad, Vol. XLVI, No. 7, p. 789, 1928.

*Euproductus*, Whitehouse (Nom. nuda), Aust. Assn. Adv. Science, p. 282, 1926.

*Anidanthus*, Whitehouse (Nom. nuda), Loc. cit.

“Pedicel valve strongly convex, brachial valve flattish to slightly concave in the visceral portion, strongly geniculated towards the front, resulting in the formation of an anteriorly produced long trail. Surface marked by numerous fine, radiating striae and indistinct concentric wrinkles. A double row of spines is invariably present along the margin of the hinge line. Genotype, *Productus cora*, d’Orbigny.”<sup>1</sup>

Chao refers the following species to the subgenus *Linoproductus* :

- Productus* (*Linoproductus*) *lineatus*, Waagen.
- P.* (*Linoproductus*) *cora*, d'Orbigny.
- P.* (*Linoproductus*) *tenuistriatus*, Verneuil.
- P.* (*Linoproductus*) *simensis*, Tchernyschew.
- P.* (*Linoproductus*) *cancriniformis*, Tchernyschew.
- P.* (*Linoproductus*) *hemisphaerium*, Kutorga.
- P.* (*Linoproductus* ?) *subplicatilis*, Frech.
- P.* (*Linoproductus* ?) *sinensis*, Frech.
- P.* (*Linoproductus* ?) *mammatus*, Keyserling.

To these must be added *P.* (*Linoproductus*) *aagardi*, Toula, 1875 ; *P.* (*Linoproductus*) *waagenianus*, Girty, 1908 ; *P.* (*Linoproductus*) *eucharis*, Girty, 1919 ; *P.* (*Linoproductus*) *cora* var. *farleyensis*, Eth. & Dun ; and the new species herein described, *Linoproductus springsurensis*.

Owing to overlapping\* in researches Fredericks' genus *Cora*,<sup>2</sup> genotype, *Productus cora*, d'Orbigny, is synonymous with Chao's *Linoproductus*, 1927.<sup>3</sup> Chao's subgenus must be accorded priority over Fredericks', having been published in 1927. Fredericks' genera unfortunately are described in Russian, with only a short English summary, which is very vague.

In two footnotes to a paper published in 1926, Whitehouse<sup>4</sup> refers to *Euproductus*, genotype *Productus cora*, d'Orbigny and *Anidanthus*, "a new genus proposed for a new species of productid (figured in Jack and Etheridge, Geology and Palaeontology of Queensland and New Guinea, Pl. 12, fig. 16, and Pl. 44, fig. 13)." *Euproductus* must therefore be regarded as synonymous with Chao's *Linoproductus*.<sup>5</sup>

The two figures referred to as *Anidanthus* appear to represent two very different forms, of which one (Pl. 44, fig. 13) is that herein described as *Linoproductus springsurensis*. I have examined the cast of a specimen showing the external ornament of a pedicle valve from Saltbush Park, Nebo District, which I understood had been referred by Whitehouse to *Anidanthus*. This was referable to *Linoproductus springsurensis*. I have also a photograph of two specimens of *Anidanthus* from Lake's Creek, Rockhampton. These appear to differ very materially from the Springsure and Saltbush Park specimens, particularly in the size and contour of the valves, in the ornamentation and degree of demarcation of the ears. *Productus cora*, var. *farleyensis*, Etheridge and Dun<sup>6</sup> is also referred to *Linoproductus*, Chao.

*Linoproductus springsurensis*, sp. nov.

Compare *Productus*, sp. indt. cf. young of *P. giganteus*, Martin. Jack and Etheridge, Geol. and Pal. of Queensland and New Guinea, 1892, p. 257, Pl. 44, fig. 13.

Shell small. Pedicle valve much curved, inrolled and spreading transversely. Umbo inflated, pointed and strongly incurved. Ears depressed, flattened and distinctly marked off from the visceral portion

of the valve. A shallow sinus is present, but the degree of development varies considerably in individual specimens. The hinge line is very long and straight.

The brachial valve is flat or slightly concave in the visceral portion and is then strongly geniculated and produced to the anterior margin.

The surface of the pedicle valve is marked with fine radiating striae. On the visceral portion of the valve there are on an average about 16 striae in 10 mm.

The following table shows the size of the specimens and the coarseness of the ornament:—

Locality	Length	Breadth	No. of Striae in 10 mm.	
	25 mm.	19 mm.	14	} (Type)
	29 mm.	23 mm.	15	
Springsure	31 mm.	21 mm.	18	} (Paratypes)
Dome	30 mm.	16 mm.	15	
	32 mm.	25 mm.	16	
	29 mm.	—	14	
	30 mm.	20 mm.	18	
Saltbush Park	29 mm.	21 mm.	16	}
	21 mm.	13 mm.	12	
	23 mm.	16 mm.	14	

Near the anterior margin of one or two specimens are a few obscure tubercles, probably the bases of spines. Spines also occur along the hinge line. Concentric wrinkles are developed on the ears and pass into obscure, widely spaced, low undulations on the visceral portion of the valve.

The brachial valve is ornamented with radiating striae, similar to those of the pedicle valve. A number of strong, irregularly spaced concentric wrinkles occur on the visceral portion of the valve. The brachial valve has a well developed cardinal process and a septum extending anteriorly for approximately two-thirds of the distance from the hinge line to the point of geniculation of the valve. The muscular impressions are compact and undifferentiated.

Main Horizon: Upper section of Dilly stage, Lower Bowen, with a known range from the main Eurydesma horizon to the top of the stage.

Localities: Cattle Creek and Little Gorge Creek, Springsure Dome; Saltbush Park, Nebo District; Mt. Britton; Yatton Goldfield, Queensland.

*Linoproductus springsurensis* is closely related to *Productus* (*Linoproductus*) *waagenianus*, Girty,<sup>7</sup> *P. (Linoproductus) eucharis*, Girty,<sup>8</sup> and *P. (Linoproductus) aagardi*, Toulou.<sup>9</sup>

Girty's description of *P. waagenianus* is as follows :—

“ *Productus waagenianus*, n. sp.”

“ Shell small. Ventral valve much inrolled, gradually spreading transversely. Beak inflated, pointed, strongly incurved, slightly projecting. Ears small, depressed, quadrate, flattened. Sinus absent. Towards the margin the shell develops a few low folds.

“ Dorsal valve nearly planate, with a narrow geniculated portion around the front and sides, beak small indistinct, ears undefined.

“ Surface marked by radiating lirae, concentric lirae, concentric wrinkles and spines. Lirae very fine, about 14 in 5 mm. ; low, rounded, separated by intervals as wide or wider than themselves. Concentric lirae rather coarse, but indistinct. Wrinkles faint, distant, covering more than half the surface ; strong on ears. Visceral portion with a few rather large nodes, which may have been bases of spines, some of which appear to have been located on the ears, especially near the hinge line. The foregoing description, so far as it relates to the surface, is based on the ventral valve. The surface of the dorsal valve is marked by concentric wrinkles (and presumably concentric lirae) and radiating lirae. The wrinkles on this valve are very strong, regular, subimbricating and rather distant, covering the surface as far as the geniculation. The shape and ornamentation are such as to simulate certain varieties of *Leptaena rhomboidalis*. The wrinkles are so much stronger than those of the ventral valve as to suggest that the two shells do not belong together ; but the other characters are similar, they are associated in the same beds, and nothing has so far come to hand which in either case could be taken for a supplementary valve. I have at present little doubt about their relationship. Were it not for the peculiar character of the dorsal valve it might perhaps have been possible to refer this form to the common *P. cora* ; but with the present association it is out of question.”

Diener refers to *P. waagenianus*, Girty a form from the Zewan beds of Mandakpal.<sup>10</sup> He mentions one specimen from the neighbourhood of Sangcha Malla in Eastern Johor, which had previously been identified as *P. Planohemisphaerium*, Netsch and which “ may probably be referred provisionally to *P. waagenianus* or *P. eucharis*, Girty.”<sup>11</sup>

A specimen previously referred to as *Strophomena analoga*, Phill.<sup>12</sup> is also referred to *P. waagenianus*.

*P. aagardi*, Toulas was the earliest of this group of producti to be described.<sup>13</sup> A free translation of Toulas's original description is as follows :—

“ A small *Productus* with unusually well arched pedicle valve. This rises steeply from the anterior margin in a sharp bend and falls away steeply to the produced and pointed umbo. The latter projects only slightly over the hinge line and is especially



sharp at the umbo, yet incurved. The greatest breadth lies behind the straight hinge line. From this strong wrinkles lead up the sides without reaching the top (of the valve). The shell is coarsely striated; the striae run straight in the umbonal region but beyond that are more irregular. They are very crowded in the middle of the shell, where their number is augmented by intercalation. A strong median sinus is visible in the centre of the valve. The shell is comparatively thick and no traces of spines are visible on the surface.

“*Productus cora*, d’Orbigny, is perhaps most closely related to our species as regards the form and height of the pedicle valve, but the thickness of the shell, the coarse striations, and the small size of our species are striking.

“Dimensions: Breadth, 20 mm.; height, 13 mm.; length, 15 mm.; breadth of largest specimen, about 28 mm.”

The Uralian type of *P. aagardi* figured by Tchernyschew<sup>14</sup> differs considerably from Toula’s description and figures. Unfortunately, Tchernyschew’s description is in Russian, but his figures show a long hinged, inflated shell with fine striae and larger ears than Toula’s specimens, and in addition Tchernyschew’s figures do not show a sinus. It is possible that Tchernyschew had a series of specimens showing the transition from Toula’s form to his own, but if so he does not mention them. The specimens he figures, however, appear to resemble Diener’s Zewan specimens of *P. waagenianus* more closely than they do Toula’s original figures of *P. aagardi*, particularly in the finer and more regular striation and the absence of a median sinus.

Girty compares *P. waagenianus*<sup>15</sup> and *P. eucharis*<sup>16</sup> with *P. aagardi*. He states that “*P. waagenianus* is related to the Arctic species *P. aagardi*, Toula, not only in a general way but in the plicated condition of the dorsal valve. It is distinguished from it however by its much finer liration.” As Toula does not mention the brachial valve in his description or include a figure of one in his plates it is evident that Girty’s comparison is with some other figures, possibly those of Tchernyschew. The same remarks apply to the comparison of *P. eucharis* with *P. aagardi*. *P. eucharis* resembles *P. waagenianus* very closely; in fact Diener<sup>17</sup> states “the only character of difference which I can find, is the presence of spines in *P. eucharis*,” some of them large enough to occasion the deflection of the radiating lirae.” *P. eucharis* is also without a median sinus.

Less closely related is *Productus rewahensis*, Cowper-Reed.<sup>18</sup>

*Linoproductus springsurensis* is very closely related to *P. waagenianus*, Girty and *P. eucharis*, Girty. The striation of *L. springsurensis* is coarser than that of the Guadelupian form and it is probably nearer the Delaware variety,<sup>19</sup> which has about eight or nine striae in 5 mm. *L. springsurensis* is also closely related to Diener’s Zewan form of *P. waagenianus* and to the Uralian form of *P. aagardi*, Toula, figured by Tchernyschew. It differs from all these however in the possession of a shallow, ill defined sinus, which varies consider-

ably in the extent of its development, being present in about sixty per cent. of the specimens examined as a definite shallow sinus. In the rest it is very shallow indeed or represented only by a flattening of the shell along the median line, combined with a flexing of the growth lines and an irregularity of the striae in that part of the shell.

*L. springsurensis* resembles Toula's Arctic form of *P. aagardi* in the possession of a sinus, but differs from it in the considerably longer hinge line and more inflated and incurved umbo.

Associated with *Linoproductus springsurensis* in the Dilly beds of Springsure Dome is a large *Productus* referable to *Productus (linoproductus) cora*, d'Orbigny, which also occurs with *L. springsurensis* at Saltbush Park, Nebo district. A large *Strophalosia* referable to the common *S. gerardi* and a *Spirifer* of the *S. stokesi* type also occur in the same beds. Both these forms occur in the Lower and Upper Marine Series of New South Wales.

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## DESCRIPTION OF PLATES.

## PLATE III.

- Figs. 1, 2 *Linoproductus springsurensis*, sp. nov. Pedicle valve of Type specimen from Upper Zone of Dilly Stage, Lower Bowen, Cattle Creek, Springsure Dome, Queensland. × I.
- Figs. 3-6 *Linoproductus springsurensis*, sp. nov. paratypes from the same locality. × I.

## PLATE IV.

- Fig. 1 *Linoproductus springsurensis*, sp. nov. Drawing by Mr. I. W. Helmsing of the exterior of a brachial valve, showing ornament and concentric wrinkling. Locality Cattle Creek, Springsure Dome. × I.
- Fig. 2 *Linoproductus springsurensis*, sp. nov. Photograph of the specimen shown in Fig. 1. × I.
- Fig. 3 *Linoproductus springsurensis*, sp. nov. Interior of a brachial valve showing septum and muscular impressions. Locality, Cattle Creek, Springsure Dome. × I.
- Fig. 4 *Linoproductus springsurensis*, sp. nov. Interior of brachial valve showing geniculation. Locality, Cattle Creek, Springsure Dome. × I.
- Figs. 5 & 6. *Linoproductus springsurensis*, sp. nov. Brachial valves from Saltbush Park, Nebo district, Queensland. × I.
- Fig. 7 *Linoproductus springsurensis*, sp. nov. Cast of pedicle valve from Saltbush Park, Nebo district. × I.